
An Irishman looks at some Australian Forests.

By J. HEVERIN

Introductory.

DURING the postwar years the Forestry Commission of New South Wales established what were known as Survey Units for the purpose of carrying out Survey assessment and road location in unclassified and unsurveyed areas of virgin forest land. The writer has been a member of such a unit and proposes giving in this article some impressions of forest conditions and practices in that State.

General.

New South Wales is fortunate in having a varied and useful tree flora. Forest reserves however are not very great, the present dedicated forest area being 2.2% of the total land area. The native trees particularly the eucalypts, supply some of the finest hardwoods in the world but there are only a few native species such as hoop pine (*Araucaria cunninghamii*) and the Cypress Pines (*Callitris* species) which yield softwoods. In their form, habit and other characteristics the native trees exhibit considerable diversity which is related to the wide range of soil and climatic conditions obtaining throughout New South Wales. On the one hand there are the rain forests of the North Coast where the rainfall sometimes exceeds 60" and where conditions generally are of a tropical or subtropical nature. On the other hand there is the heat blasted plains of the Far West with summer temperatures reaching 110 degrees with arid areas which are not utilized for any purpose. Between these extremes are the semi-alpine conditions of parts of the Tablelands and elsewhere we find temperate regions of varying rainfall and areas with climatic conditions most closely approximating to those of Ireland.

Tree Species.

Many hundreds of different species go to form the pattern of the tree life but the eucalypts are dominant in most areas. They are found almost throughout N.S.W. in moist coastal valleys, on the wind-swept plateaux of the Tablelands and on the dry plains of the interior. They include about 235 different species, apart from varieties and are known mainly as gums, stringybarks, ironbarks, boxes, peppermints, ashes and bloodwoods, such names being based mainly on bark and timber characters. Timber of very high value is provided by most species, 80% yielding excellent marketable timbers. Their usefulness in this respect has been recognised by other countries, extensive plantings having been made in North America, South America, in Mediterranean regions and in New Zealand.

The eucalypts range in size from small whipstick-like mallies to giants over 200 feet in height. They include some of the fastest growing commercial trees in the world, some stringybarks being recorded as growing to a height of 20 feet in one year from seed and blackbutt (*E. pilularis*) has been recorded as reaching 40 feet in 3 years. Quite a number of eucalypts are very ornamental and most varied in their appeal and many yield valuable oils which are finding ever-widening uses. The merchantable volume increment of the irregular eucalypt forest is low because of waste, unsaleable thinnings and defective logs. An inherent character of the species is the development of faulty wood in the centre of the bole which proceeds from brittleness in young trees to doziness and ultimately to a cavity or pipe in mature timber. A yield of 50 cubic feet of merchantable logs per acre per year is a good yield for eucalypts in Australia and 100 cubic feet a very good yield. Forests of *Euc. regnans*, *Euc. diversicolor*, *Euc. gigantea* and patches of pure *Euc. pilularis* and *Euc. grandis* may give 200 cubic feet per year or sometimes more under favourable conditions of utilization and in the absence of fires.

The genus *Acacia* resembles the *Eucalyptus* in that its species are found all over New South Wales from the coast line to the Far West. Many of them are only small shrubs but quite a number attain tree size. They are of considerable horticultural value, being fast growing and providing a wealth of blossom in the winter and early spring when other flowers are scarce. Much of the rather austere bushland is brightened by the soft blaze of the golden wattle and it is now generally recognised as Australia's floral emblem. Apart from their ornamental character the wattles have many economic uses. The bark contains one of the most useful tanning materials in the world, the tannin content of some species being over 50%. It is a true soil-improving species and important in maintaining soil fertility. Wattle seeds are interesting in that they have a very hard coat which enables them to retain their vitality for long periods—in some cases up to 50 years.

Apart from species of *Eucalyptus* and *Acacia* there are in New South Wales approximately 380 species of trees and these are contained in a wide range of botanical families, the most important being the *Casuarinas* or "she oaks," figs, laurels and myrtles. The Pine family is not strongly represented in New South Wales. The hoop pine (*Araucaria cunninghami*) is probably the most important species as it provides a valuable softwood. Eight species of cypress pine (*Callitris* species) are found widely distributed from the coast line to western areas.

Man's Influence.

Over one hundred and fifty years of settlement have produced far-reaching effects on the tree flora of New South Wales. The clearing of agricultural and pastoral lands has resulted in almost complete destruction of tree life in many districts. It is, of course, true that many areas show little or no effect of settlement and it is probably equally true that some of these areas will retain more or less indefinitely their distinctive tree flora quite uninfluenced by the activities of the white man. For, apart from natural reserves, there are some parts of New South Wales which are quite unsuitable for settlement of any kind and sufficiently remote to be left undisturbed even in the midst of an expanding population. But in many districts the sound of the axe has been loud in the land and the noise of crashing trees has been the note of progress. On many properties the destruction of tree life has been entirely unjustified and often the landowner has not left sufficient shade and shelter trees for the needs of stock. Forest lands have been exploited and a forest policy has only begun to emerge from the disturbances created by pioneering settlement. A great deal of planting will be necessary in many parts although much could be done by encouraging natural regeneration though the exclusion of stock from selected portions.

Fires have become far more frequent and widely distributed since settlement and have had a considerable effect on tree life. There is, however, always some survival and regeneration, in many cases quite extensive so that the tree flora does not lose its identity. In many cases the trees forming the community, although considerably damaged by fire, re-establish themselves by suckers or by shoots from root stocks. The great majority of eucalypts produce suckers from trunks and branches very freely after fire. Their ability to survive fire seems to depend to some extent on the nature of the bark. The thick rough bark produced by some species seems to insulate the cambium layer and it is not so much affected as in the thinner smooth-barked species. The fire-resistant qualities of the seed of many Australian plants is very well known, the most common example being provided by the wattles which have a very hard coat protecting the embryo from damage and it is a common experience for seed germination to be greatly stimulated by fire passing over the area.

From the early days of settlement the white man found that certain timber-producing species were suitable for his requirements and were therefore much in demand. The first phase was undisguised exploitation of such trees without any consideration being given to the need for replacement. As supplies became limited attention was given to the conservation of remaining supplies and the establishment of plantations. The general effect of settlement therefore was the gradual disappearance of certain species but, when the consequences of this were realized, conservation and planting resulted.

Exotic Species.

Very few trees introduced from other countries have become naturalised in N.S.W. The most common ones which have become established by natural means are insignis pine (*Pinus radiata*), tree of heaven (*Ailanthus glandulosa*) and the olive (*Olea europea*).

Early settlers introduced many species, partly for sentimental reasons in a desire to recreate the atmosphere of their homeland and partly for utilitarian purposes. Looking back, however, over the past century and a half, it is difficult to trace any very definite system or planning in the work of tree introduction. There is a great necessity for obtaining further tree species especially as there are many districts in which it is difficult to recommend with certainty of success, any but a very few species.

When the most commonly grown introduced trees in N.S.W. are classified it is found that the great majority of them come from countries of similar latitude such as the Mediterranean regions generally. Some cultivated trees have been introduced from Western Europe. The oak (*Quercus robur*) has been planted in many districts for reason of sentiment and has sometimes made quite good development. The common elm (*Ulmus procera*) has succeeded in cooler, moister areas. The larch (*Larix decidua*) has not proved very well adapted to the conditions but most of the pines and cypresses from the Mediterranean and Southern Europe have proved successful.

The cold-country species of Europe and America reach their best development in the region which is known as the Tablelands and here too we find districts whose climate most closely resembles that of Ireland. The Tablelands have an altitude varying from 1,500 to 3,000 feet with some districts fairly cold in winter months with heavy frosts fairly common and rainfall varying from 35 to 45 inches. Soils are mainly of sandstone origin but there are some areas of shale and basalt.

The most valuable eucalypts of the area and those which should have the best chance of succeeding in the colder climates of Europe are Mountain Ash (*E. gigantea*), snow gum (*E. pauciflora*) smooth-barked ash (*E. oreades*), ribbon gum (*E. viminalis*) and mountain gum (*E. goniacalyx*) all of which are good timber producing species and reproduce themselves freely.

Silvicultural System.

The establishment of fixed minimum exploitable girths in the mixed eucalypt forest by the Australian forest authorities imposed a form of selection of trees or groups of trees for utilization as a result of which scattered groups of regeneration came up in gaps of the forest. This form of exploitation led to a variable silvicultural system which was classified as the "Group Selection System." The objective in fixing minimum exploitable girths is the principle of sustained yield in which the cut is limited to the growth capacity. The moisture demanding eucalypts are considered as the parallel of the light demander in Europe and can be treated in the same way—by opening the forest in groups. The system has many advantages and possibly the most important is that the whole forest is worked-over every period of say, 10 years. In Australia the idea of locking up part of the forest for a rotation is abhorrent.

Similarly with the objective of sustained yield, control is exercised over the number of sawmills allowed to operate by a system of licensing and restricting the number of licences to meet the capacity of the forests concerned. Areas are allocated under licence to sawmillers and a sale contract is drawn up specifying the silvicultural system to be adopted, the amount and method of cutting and other restrictions placed on the sawmiller.

Sales of Timber.

All sales are based on the price of the standing timber on the "stumpage appraisal system" which is the sum remaining after the cost of transportation and production with a margin of profit have been subtracted from the selling price of product. The Forester is responsible for the determination of the stumpage value in the area under his control and is one of his most important and involved duties as it is necessary for him to have an intimate knowledge of the quantity, quality and kind of timber to be sold, the topography of the area, the access thereto, the cost of operating a sawmill, haulage costs, freights, etc.

Stumpage or standing value is calculated by the quarter girth system giving the volume in super feet Hoppus and this is equated to the true volume of the sawn product. In N.S.W. the Forestry Commission has adopted the policy of giving sawmillers access to the appraisal of stumpage value on their particular areas and of discussing with them matters of allowances for the extraction and haulage of the logs etc. In many instances the purchaser is made an allowance for road construction which he undertakes in areas where access is difficult and is reimbursed to the extent of the cost of construction by means of reduced stumpage rate.

All such roads are built on sites determined by the Commission and to the required specification. The Commission employs a staff of

technicians who survey proposed roads and determine the best location, alignment and grades. Roads are then designed to the required specification having regard to width, surface, drainage and any improvements needed in alignment and grades before construction proceeds.

Forest Survey Units.

All sales and roading contracts must conform to the plan or management of the forest or area which plan is formulated from the report submitted by special survey units such as mentioned in the introduction of this article. Consequently the utmost importance is attached to the organisation and operation of the survey units, particularly in the case of uncharted and unassessed areas. After a reconnaissance and a quick preliminary inspection an area, sometimes 100,000 acres or more, is considered desirable for dedication as a state forest and here the survey unit is used to make a further intensive non-precision survey for the purpose of formulating a management plan.

The normal survey party consists of an officer-in-charge, an estimator and a labour staff. Whenever possible it is customary to assign an assistant to the officer-in-charge for training as a replacement or nucleus of a further party. All employees engaged must be carefully selected as the whole party must live together over long periods in camp removed from the comforts and amenities of ordinary living. It is essentially a young man's job involving a great deal of hard walking every day.

The whole of the assessment depends on the reliability, skill and judgment of the estimator. He should have a sound knowledge of logging, milling and timber conversion operations, be able to identify the species and keep field notes.

Transport is one of the main difficulties associated with survey camps and the most useful type of vehicle is the four-wheel-drive type such as a landrover or jeep with trailer. This allows of supplies of food at regular intervals as well as shortening walking time where trafficable roads are available while shifting camp is greatly expedited. In certain cases consideration is given to the use of pack horses for bringing up supplies where access is difficult.

The checking of all equipment, instruments, tools, drawing materials, camping gear, cooking utensils, first aid outfit and personal equipment such as blankets, is of the utmost importance owing to the difficulties of getting replacements later.

The survey camp is organised from the head office of the Forestry Commission and instructions concerning the survey are given direct to the officer-in-charge but the responsibility for the conduct and efficiency of the camp and operations devolves on him. The campaign of operations is in most cases greatly facilitated by consultation with the district and local foresters who generally have a knowledge of the area to be

surveyed. They are able to advise on the existing routes of access, the location of permanent water, camp sites, etc.

The first consideration is the selection of a main camp site and this choice is restricted to places in proximity to permanent water and in most cases by the limits of truck access.

Other aspects to be considered are the transport of food supplies, protection from wind, flooding and fire. All the details of where and where not to camp are learnt by actual experience of the discomfiture of an ill-chosen site. The advisability of shifting camp to facilitate the work must always be kept in mind or the original camp may be left partially erected while the party proceeds to a "flying camp" for two or three days duration.

While the Forestry Commission provides a cook for the camp the question of food is one of mutual agreement. It is usual to establish a mess with equal contribution by all hands towards the cost of supplies. The field work involved generally follows the same procedure, i.e., the establishment of boundaries, volume assessment, identification of species, division into logging areas, volume table data collection, etc.

Aerial Surveys.

Much of the conditions and practices of survey are being gradually superseded by improved techniques in survey and assessment from aerial photographs. Contour and topographical maps from photo interpretation and maps showing broad forest types are being prepared. To obtain maximum use of an aerial survey for planning of roading and logging it is essential that it should be possible from the study of photographs to give accurate volume estimates of timber stands of approximately 40-50 acres. Much work has been done on timber volume estimates and considerable progress has been made in this field. At the same time there is no doubt that some of the reports on the use of photography appear to be over-enthusiastic, particularly where 20-40 chains to 1" photography has been used.

Generally speaking it is true that this work is still very much in the experimental stage in Australia and outstanding success with volume estimates from the air appears to be either in connection with reconnaissance work covering very large areas or in homogeneous well stocked stands of coniferous species, in each case supported by random sampling by ground parties and the establishment of a scale of comparison between ground plots and photo plots for direct visual estimates from the photographs.

It appears however that margins of error usually are large and these methods are unsuitable for intensive planning of logging and roading in Australian eucalypt forests where stand volume changes rapidly from place to place.